Alberta Health

Tick Surveillance

2015 Summary

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Alberta Government

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Introduction

There are many species of ticks native to Alberta, for instance, moose ticks and Rocky Mountain wood ticks (*Dermacentor* species). These species are not considered vectors for transmitting the bacteria that can cause Lyme disease (*Borrelia burgdorferi* sensu stricto) in humans[1]. *Ixodes* species ticks, especially *Ixodes scapularis* ticks, are capable of carrying and transmitting *B. burgdorferi* to humans[2]. The range of *Ixodes scapularis* ticks has been expanding into Canada in the last few years and they are now considered endemic in southern Manitoba, southern and eastern Ontario, southern Quebec and in the Maritimes[2]. Alberta has found *I. scapularis* ticks in small numbers in the province but, so far, they have been considered an adventitious population. This means they are carried into Alberta by migratory birds or other animals but do not survive over winter and reproduce.

In 2007, Alberta Health and Alberta Agriculture and Forestry (AF), in collaboration with veterinarians in the province, began a tick surveillance program to examine types of ticks found on companion animals (e.g., pet dogs). In 2013, the Alberta Arthropod-Borne Diseases Committee, a collaboration of Alberta Health, Alberta Agriculture and Forestry, Alberta Health Services, Health Canada First Nations and Inuit Health Branch and other stakeholders, expanded the surveillance program to accept submissions of ticks found on humans or in the environment. Alberta Agriculture and Forestry conducts the laboratory analysis on all* submitted ticks and manages the companion animal program.

The goal of the Enhanced Tick Surveillance Program is to assess the risk of Lyme disease in Alberta. To do this, the program uses both active and passive surveillance. "Passive surveillance" and "active surveillance" are technical terms that describe how the program acquires the samples. In passive surveillance members of the public collect and submit ticks that they find on themselves, their pets, or in the environment. Active surveillance consists of drag-sampling in grassy/bushy areas (see Figure 8 for more information). The results of passive tick surveillance are used to determine the best locations to do active tick surveillance.

The enhanced passive surveillance system can detect both established and adventitious populations. The active surveillance component helps differentiate between them. Together these surveillance activities help Alberta determine if there is an emergence and establishment of *Ixodes* ticks in Alberta. This will help determine the level and geographical distribution of risk to Albertans if or when the ticks establish themselves in the province in the years to come. This report outlines the findings from the third season (2015) of the Enhanced Tick Surveillance Program, and compares it to the 2013 and 2014 findings.

* AF does not analyze clinical samples submitted by physicians. Such samples are sent to the Provincial Laboratory for Public Health

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Key Findings

- Of 1,814 tick submissions, there were 133 *Ixodes*[†] ticks submitted, 75 of which were likely acquired in Alberta.
- The peak of *Ixodes* submissions was the last week in May and the first week in November.
- 11 out of 75 (15 per cent) *Ixodes* ticks acquired in Alberta were positive for *B. burgdorferi*, all of which were found on companion animals.
- While *Ixodes* ticks were found in all health zones through passive surveillance, Edmonton Zone had the highest prevalence at 59 per cent. This is similar to previous years.
- Active surveillance in Edmonton Zone did not find any *Ixodes* ticks.

Results

There were 1,872 submissions to the Enhanced Tick Surveillance Program. The majority of submissions continues to be through the Companion Animal program (n=1,298). However the submissions from Human and the Environment Program increased by 41 per cent between 2014 and 2015 (Table 1). The majority of submissions to the program occurred during the late spring and early summer, with submissions from hosts who had not travelled out of Alberta peaking in week 21 (May 24-30, 2015) (Figure 1). Ixodes species ticks had two clear peaks: one in week 21 in the spring (May 24-30, 2015) and one in week 44 in the fall (November 1-7, 2015).

The majority (97 per cent, n=1,814) of submissions were identified as a species of tick; 58 submissions were of insects, other types of arachnids or were unable to be identified. 757 (42 per cent) were from individuals who were not Alberta residents or who travelled outside of Alberta and likely acquired the tick there; 1,057 (58 per cent) were from Alberta residents who either did not travel or only travelled within Alberta (Table 2). Of the 1,814 ticks submitted, 133 (seven per cent) were *Ixodes* ticks; 75 of the *Ixodes* ticks (56 per cent) were acquired inside of Alberta, and 58 (44 per cent) were likely acquired outside of Alberta. Of those 75 *Ixodes* ticks acquired inside Alberta, 11 (15 per cent) were *Ixodes* ticks positive for *B. burgdorferi*.

All but three of the 133 *Ixodes* ticks submitted to the program were adults. Two nymphs found on human hosts were brought into Alberta through travel to countries with endemic populations of *Ixodes*. One nymph was found on a companion animal from South Zone. It was considered likely to be an adventitious tick as only one other *Ixodes* has been submitted from the area in the past eight years (in contrast to other municipalities with smaller populations but much larger numbers of *Ixodes* submissions).

To determine the geographic distribution of ticks, a sub-analysis was performed where ticks submitted by visitors to Alberta and by residents who had travelled in the previous two weeks were excluded. Fifty-seven *Ixodes* ticks were submitted by Alberta residents who had not travelled. While *Ixodes* ticks were found in all zones, the majority (n=34, 59 per cent) of *Ixodes* ticks were

[†] *Ixodes* species excluding *Ixodes kingi and Ixodes ochtonae*. *I. kingi* and *I. ochtonae* are not considered vectors for *Borrelia burgdorferi*.

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found in Edmonton Zone (Table 3). This is similar to the findings in 2014 and 2013 (Tables 4 and 5). *B. burgdorferi* positive ticks submitted in 2015 by non-travellers were found in Edmonton Zone, Central Zone, and North Zone.

Residential postal codes of the humans and animals that submitted *Ixodes* ticks and had not travelled in the past two weeks were mapped to show the geographic distribution (Figures 2 – 5). In hosts that had not travelled or had travelled within Alberta, information regarding the outdoor locations they had visited in the previous two weeks was collected. This information was also plotted on a map (Figures 6 and 7). Potential sites for active surveillance were identified based on visual clustering of residential postal codes and outdoor locations in proximity to an area that could be considered suitable habitat for ticks (i.e. a natural area with mixed forest and grasslands).

Active Surveillance

Based on the 2015 passive tick surveillance results, five sites were selected in Edmonton Zone for active surveillance. Active surveillance was performed on four days in June, July, August and September. Teams conducted drag sampling and visually inspected themselves and the drag for ticks at regular intervals (Figure 8). No ticks were found.

Conclusion

While the number of tick submissions continues to rise in Alberta, the number of *Ixodes* ticks submitted in 2015 remained approximately the same as in 2014. While three nymphs were found through passive surveillance, it is unlikely to be due to an endemic population as two were related to travel to endemic countries and one was acquired in an environment not conducive to *Ixodes* survival. Active surveillance activities have not found *Ixodes* ticks. Because of this, it is likely that the *Ixodes* ticks found in Alberta are adventitious, arriving via migratory birds, and have not yet established a reproducing population capable of overwintering in Alberta. Ongoing active and passive surveillance through the enhanced tick surveillance program will help us identify if a population of *Ixodes* ticks do become established in Alberta.

Acknowledgments

The Enhanced Tick Surveillance Program is a collaborative effort between Alberta Health, Alberta Agriculture and Forestry, Alberta Health Services, Provincial Laboratory of Alberta, and the Alberta Arthropod-Borne Diseases Committee (AABDC). We would also like to acknowledge the City of Edmonton for their invaluable assistance in performing active tick surveillance.

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Table 1: Submissions in 2013, 2014, and 2015, by program

	2015		2014		2013	
	N	%	N	%	N	%
Human and the Environment Program	574	31%	405	25%	219	23%
Companion Animal Program	1,298	69%	1,027	75%	753	77%
Total	1,872		1,432		972	

Figure 1: 2015 Tick submissions by hosts who had not travelled outside of Alberta, by week and species

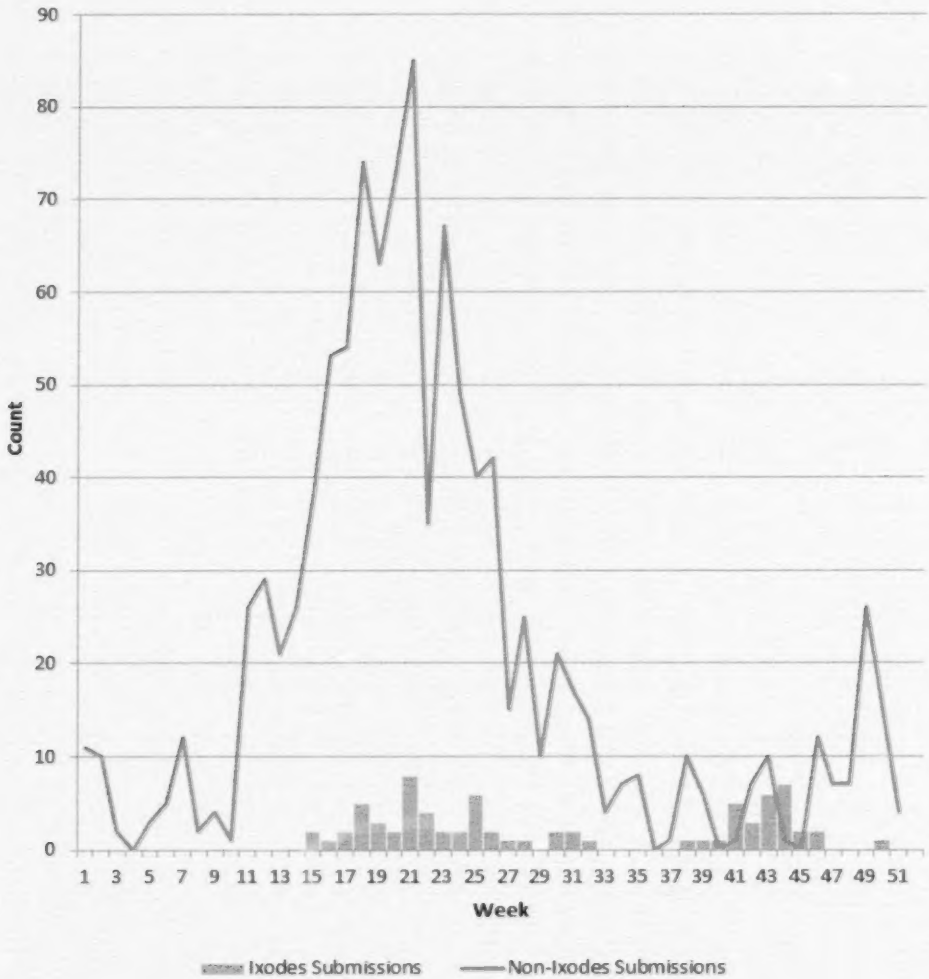

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Table 2: Location tick likely acquired in 2013, 2014, and 2015

	2015						2014						2013					
	All Tick Submissions		*Ixodes spp* Submissions		*Ixodes spp B. burgdorferi* positive		All Tick Submissions		*Ixodes spp* Submissions		*Ixodes spp B. burgdorferi* positive		All Tick Submissions		Ixodes spp. Submissions		*Ixodes spp B. burgdorferi* positive	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
All Tick Submissions*	1,814		133		20		1,376		137		15		960		171		27	
Acquired Outside Alberta**	757	42%	58	44%	9	45%	614	45%	56	41%	6	40%	380	40%	32	19%	2	7%
Acquired In Alberta§	1,057	58%	75	56%	11	55%	762	55%	81	59%	9	60%	580	60%	139	81%	25	93%
Travel within Alberta	387		18		2		251		21		6		202		34		4	
No Travel	670		57		9		511		60		3		378		105		21	

Table 3: Ticks submitted from Alberta residents with no history of travel in the previous two weeks, 2015*

	Both Programs					Companion Animal Program					Human and the Environment Program				
		Ixodes spp		*B. burgdorferi* Positive		All	*Ixodes spp*		*B. burgdorferi* Positive		All	*Ixodes spp*		*B. burgdorferi* Positive	
	All Ticks	n	%	n	%	Ticks	n	%	N	%	Ticks	n	%	n	%
Calgary	261	2	3%	0	0%	116	2	3%	0	0%	145	0	0%	0	0%
Central	94	5	8%	1	11%	73	5	9%	1	50%	21	0	0%	0	0%
Edmonton	107	34	59%	7	77%	91	31	57%	7	50%	16	3	100%	0	0%
North	81	14	24%	1	11%	73	14	25%	1	0%	8	0	20%	0	0%
South	126	1	1%	0	0%	79	1	1%	0	0%	47	0	10%	0	0%
Unknown	1	1	1%	0	0%	1	1	1%	0	0%	0	0	0%	0	0%
Total	670	57		9		433	54		9		237	3		0	

*In this report each tick is considered one submission. Multiple ticks could be submitted by one host at the same time.

**Includes submissions by individuals who are not Alberta residents and Alberta residents that travelled outside Alberta or where travel status is not known.

§ Hosts were considered to have travelled if they answered "Yes" to one of the following questions. 2014: Humans: "Did the person travel more than 100km outside their municipality in the 2 weeks prior to finding the tick?" Animals: "Out of Alberta in the last 2 weeks?" or "Out of town, but still in Alberta, in the last 2 weeks?" 2013: Humans: "Did the human travel outside of town in the last two weeks?" Animals: "Out of town in the last 2 weeks?"

β Note: This program is based on a convenience sample of submissions from volunteers. Therefore the number of ticks analyzed per zone does not necessarily correspond to the prevalence of ticks in a zone.

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Table 4: Ticks submitted from Alberta residents with no history of travel in the previous two weeks, 2014

	Both Programs					Companion Animal Program					Human and the Environment Program				
	All Ticks	*Ixodes spp*		*B. burgdorferi* Positive		All Ticks	*Ixodes spp*		*B. burgdorferi* Positive		All Ticks	*Ixodes spp*		*B. burgdorferi* Positive	
		n	%	n	%		n	%	n	%		n	%	n	%
Calgary	186	5	8%	0	0%	93	4	8%	0	0%	93	1	10%	0	0%
Central	75	7	11%	1	33%	56	7	14%	1	50%	19	0	0%	0	0%
Edmonton	97	37	61%	2	66%	79	31	62%	1	50%	18	6	60%	1**	100%
North	68	10	16%	0	0%	56	8	16%	0	0%	12	2	20%	0	0%
South	84	1	1%	0	0%	64	0	0%	0	0%	20	1	10%	0	0%
Unknown	1	0	0%	0	0%	1	0	0%	0	0%	0	0	0%	0	0%
Total	511	60		3		349	50		2		162	10		1	

**Note: This *B. burgdorferi*-positive tick was found on a companion animal but submitted through the Human and the Environment Program

Table 5: Ticks submitted from Alberta residents with no history of travel in the previous two weeks, 2013

	Both Programs					Companion Animal Program					Human and the Environment Program				
	All Ticks	*Ixodes spp*		*B. burgdorferi* Positive		All Ticks	*Ixodes spp*		*B. burgdorferi* Positive		All Ticks	*Ixodes spp*		*B. burgdorferi* Positive	
		n	%	n	%		n	%	n	%		n	%	n	%
Calgary	89	5	5%	0	0%	55	5	5%	0	0%	34	0	0%	0	0%
Central	47	9	9%	2	10%	39	9	9%	2	10%	8	0	0%	0	0%
Edmonton	133	72	69%	13	62%	126	69	68%	12	60%	7	3	100%	1	100%
North	64	16	15%	4	19%	57	16	16%	4	20%	7	0	0%	0	0%
South	45	3	3%	2	10%	16	3	3%	2	10%	29	0	0%	0	0%
Total	378	105		21		293	102		20		85	3		1	

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Figure 2: Residential postal codes of individuals who had not travelled and submitted an *Ixodes* species tick to date in 2015

Figure 3: Residential postal codes of individuals who had not travelled and submitted an *Ixodes* species tick in 2013, 2014, and to date in 2015

Legend:

- 2015 *Ixodes*
- 2015 *Borrelia*-positive *Ixodes*
- 2013 or 2014 *Ixodes*
- 2013 or 2014 *Borrelia*-positive *Ixodes*

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Figure 4: Residential postal codes of individuals who had not travelled and submitted an Ixodes species tick to date in 2015 (Edmonton Zone)

Figure 5: Residential postal codes of individuals who had not travelled and submitted an Ixodes species ticks in 2013, 2014, and to date in 2015 (Edmonton Zone)

Legend:

- 2015 *Ixodes*
- 2015 *Borrelia*-positive *Ixodes*
- 2013 or 2014 *Ixodes*
- 2013 or 2014 *Borrelia*-positive *Ixodes*

* Note: Where residential postal codes were not available, the default postal code for the municipality was utilized.

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Figure 6: Outdoor Locations Visited in 2014 and 2015 by Alberta Resident Humans and Animals from which *Ixodes* Species Ticks Were Recovered and Who Had No History of Travel in Previous Two Weeks

Legend

- 2015 Outdoor Locations Visited
- 2014 Outdoor Locations Visited

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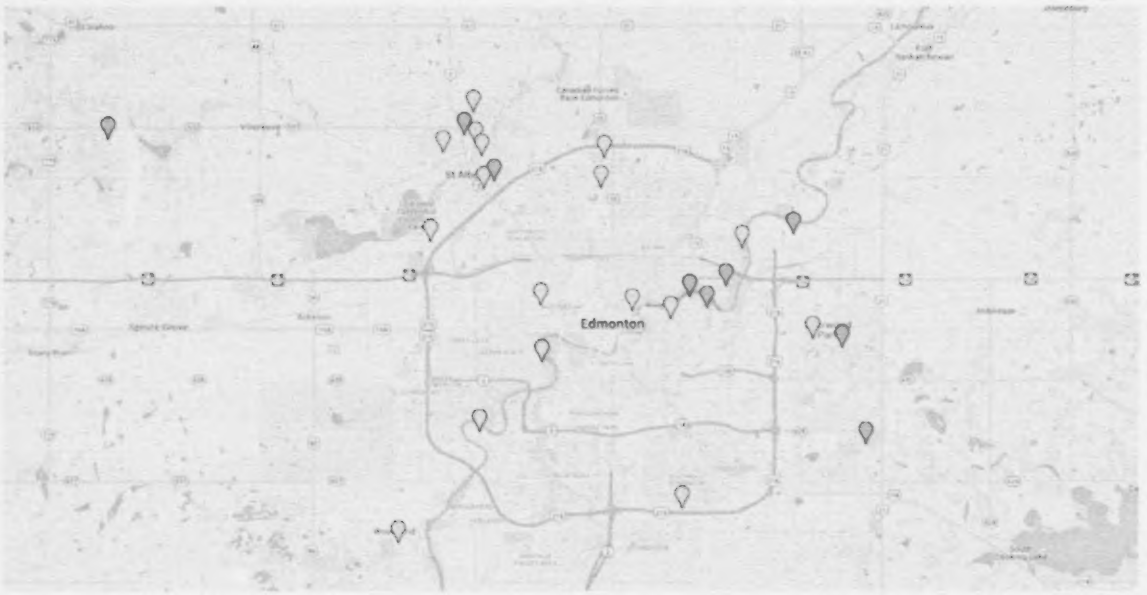
Figure 7: Outdoor Locations Visited in 2014 and 2015 by Alberta Resident Humans and Animals from which *Ixodes* Species Ticks Were Recovered and Who Had No History of Travel in Previous Two Weeks



Legend

- 2015 Outdoor Locations Visited
- 2014 Outdoor Locations Visited

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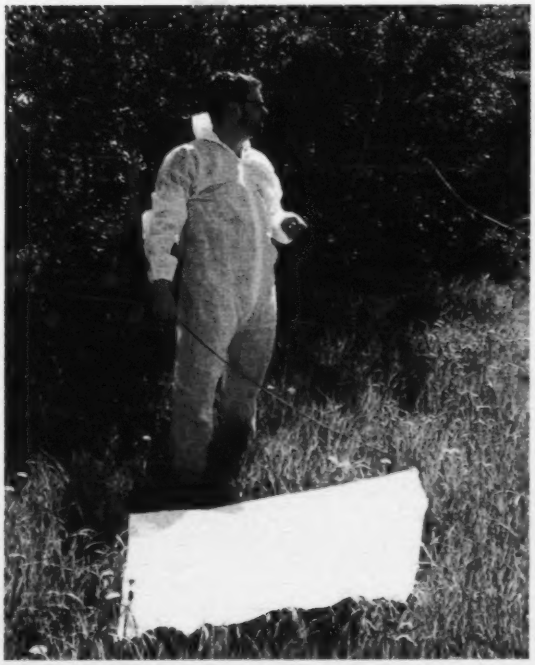
Figure 8: Photographs taken in Fall 2013 and Spring 2014 demonstrating drag sampling. Teams wore white suits and dragged flannel sheets behind them for a minimum of 1.5 person-hours per site visit. They visually inspected themselves and the drags for ticks every 10 meters.



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Appendix

Table A.1: Submissions in 2015 from Alberta residents who had not travelled within the previous two weeks, by species and zone of residence

	Calgary	Central	Edmonton	North	South	Unknown	Total
AMBLYOMMA AMERICANUM	0	0	1	0	2	0	3
AMBLYOMMA MACULATUM	0	0	1	0	0	0	1
CARIOS KELLEYI	0	0	0	0	1	0	1
DERMACENTOR ALBIPICTUS	23	38	32	42	28	0	163
DERMACENTOR ANDERSONI	154	11	8	9	62	0	244
DERMACENTOR SPP.	0	1	0	0	0	0	1
DERMACENTOR VARIABILIS	30	32	21	11	13	0	107
HAEMAPHYSALIS LEPORISPALUSTRIS	1	1	0	0	0	0	2
IXODES KINGI	23	6	0	0	19	0	48
IXODES SCAPULARIS	1	5	23	13	1	1	44
IXODES SPP.	1	0	11	1	0	0	13
NOT APPLICABLE	18	8	5	3	1	0	35
RHIPICEPHALUS SANGUINEUS	28	0	10	5	0	0	43
UNABLE TO IDENTIFY	0	0	0	1	1	0	2
Total	279	102	112	85	128	1	707

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Table A.2: Submissions in 2015 from Alberta residents who travelled within Alberta, by species and zone of residence*

	Calgary	Central	Edmonton	North	South	Unknown	Total
AMBLYOMMA AMERICANUM	1	0	1	1	0	0	3
DERMACENTOR ALBIPICTUS	5	5	14	18	3	0	45
DERMACENTOR ANDERSONI	108	16	27	7	35	0	193
DERMACENTOR HALLI	2	0	0	0	0	0	2
DERMACENTOR SPP.	0	4	0	0	0	0	4
DERMACENTOR VARIABILIS	25	25	12	1	3	0	66
HAEMAPHYSALIS LEPORISPALUSTRIS	0	6	0	0	0	0	6
IXODES KINGI	9	2	1	0	6	0	18
IXODES OCHOTONAE	0	0	1	0	0	0	1
IXODES PACIFICUS	0	0	2	0	0	0	2
IXODES SCAPULARIS	0	1	10	1	0	0	12
IXODES SPP.	0	0	2	1	0	1	4
NOT APPLICABLE	4	4	1	2	0	0	11
RHIPICEPHALUS SANGUINEUS	17	3	4	6	1	0	31
Total	171	66	75	37	48	1	398

*Please note: This table does not indicate in which zone a tick was found, but rather the zone in which the host lives. Information collected regarding outdoor locations where the tick may have been acquired is represented in Figure 6 and 7.

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Table A.3: Submissions in 2015 from hosts who travelled outside of Alberta or who are not Alberta residents, by species and zone of residence*

	Calgary	Central	Edmonton	North	South	Unknown[§]	Total
AMBLYOMMA AMERICANUM	1	0	3	0	0	0	4
AMBLYOMMA MACULATUM	0	0	1	0	0	0	1
AMBLYOMMA SPP.	3	0	0	0	0	0	3
DERMACENTOR ALBIPICTUS	1	3	0	0	5	17	26
DERMACENTOR ANDERSONI	59	3	10	8	11	2	93
DERMACENTOR SPP.	3	0	0	0	0	0	3
DERMACENTOR VARIABILIS	151	68	101	46	21	27	414
IXODES KINGI	6	1	0	0	2	1	10
IXODES OCHOTONAE	2	0	0	1	0	0	3
IXODES PACIFICUS	3	0	3	0	1	0	7
IXODES RICINUS	0	1	0	0	0	0	1
IXODES SCAPULARIS	14	2	8	4	0	2	30
IXODES SPP.	7	1	6	0	1	0	15
MISSING	0	0	0	0	0	1	1
NOT APPLICABLE	4	0	1	0	0	0	5
RHIPICEPHALUS SANGUINEUS	46	4	11	0	1	3	65
UNABLE TO IDENTIFY	0	0	1	0	0	0	1
WEEVIL	0	0	2	0	0	0	2
Total	300	83	147	59	42	53	684

*Please note: This table does not indicate in which zone a tick was found, but rather the zone in which the host lives. Information collected regarding outdoor locations where the tick may have been acquired is represented in Figure 6 and 7.

[§]Includes hosts who are not Alberta residents

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